

[54] PAIR OF COOPERATING DISKS TO CONTROL THE DELIVERY OF LIQUID IN SO-CALLED "SCREW" VALVES

[75] Inventor: Alessio Orlandi, Castiglione D/Stiviere, Italy

[73] Assignee: Galatron S.r.l., Castiglione D/Stiviere, Italy

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[58] Field of Search 137/315, 454.2, 454.5, 137/454.6, 625.31, 603, 605, 801; 251/205, 208, 209, 210, 304, 314, 316, 368

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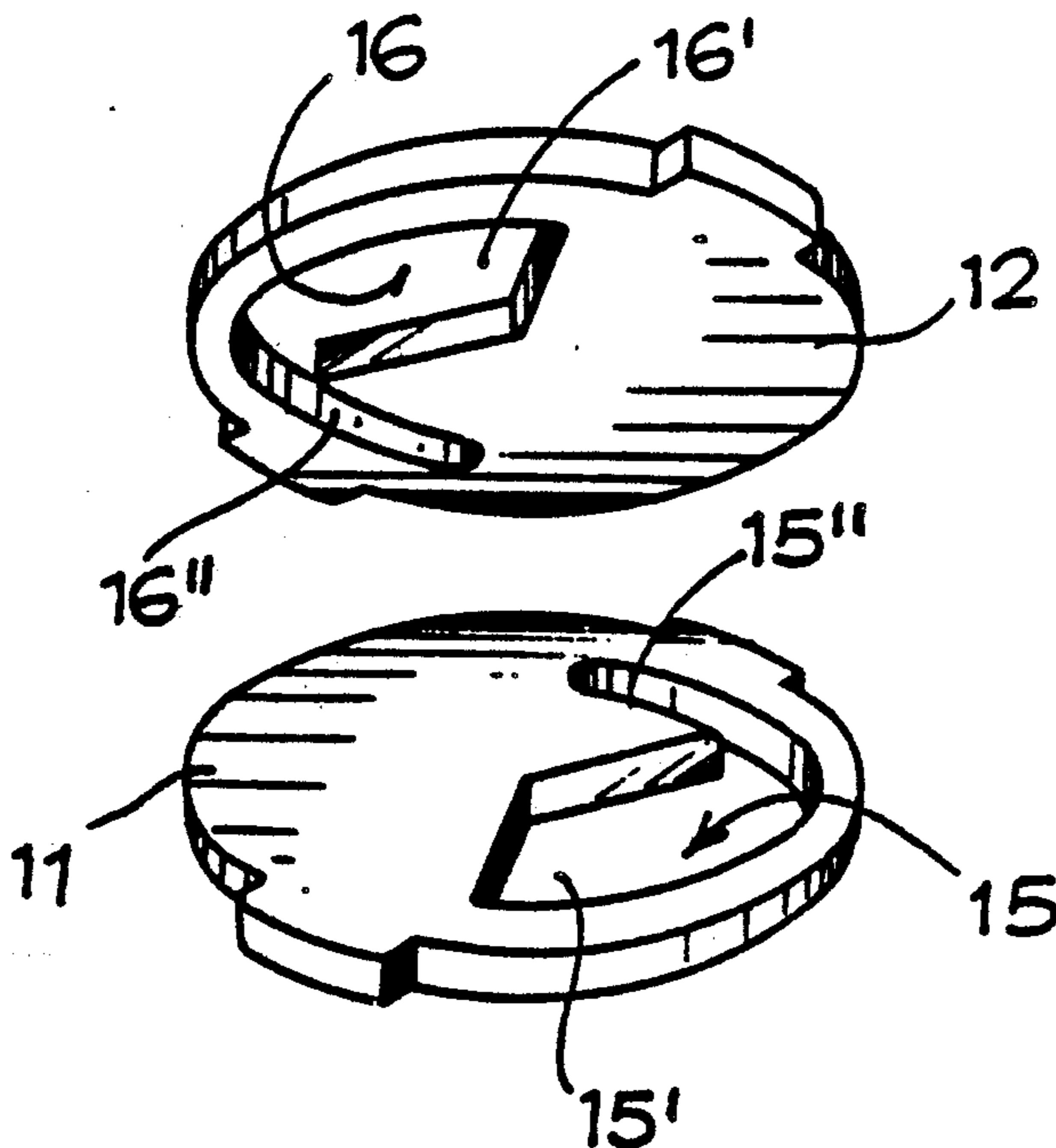
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Primary Examiner—George L. Walton
Attorney, Agent, or Firm—McGlew & Tuttle

[57] ABSTRACT

The object of the invention is a pair of superimposed ceramic disks (11,12) to open and close screw type valves, one of said disks (11) being fixed and the other one (12) being movable on the fixed disk, where each of said disks presents a slot or opening (15,16) composed by a segment portion (15',16') and by a tapered curved portion (15'',16'') extending from one end of said segment portion, the slot or opening (15) of one disk (11) being turned in a direction which is opposite to the direction of slot (16) in the other disk (12), so that when opening the valve the tapered curved portions (15'',16'') are the first to superimpose to gradually increase the flow of the delivered liquid.

3 Claims, 1 Drawing Sheet



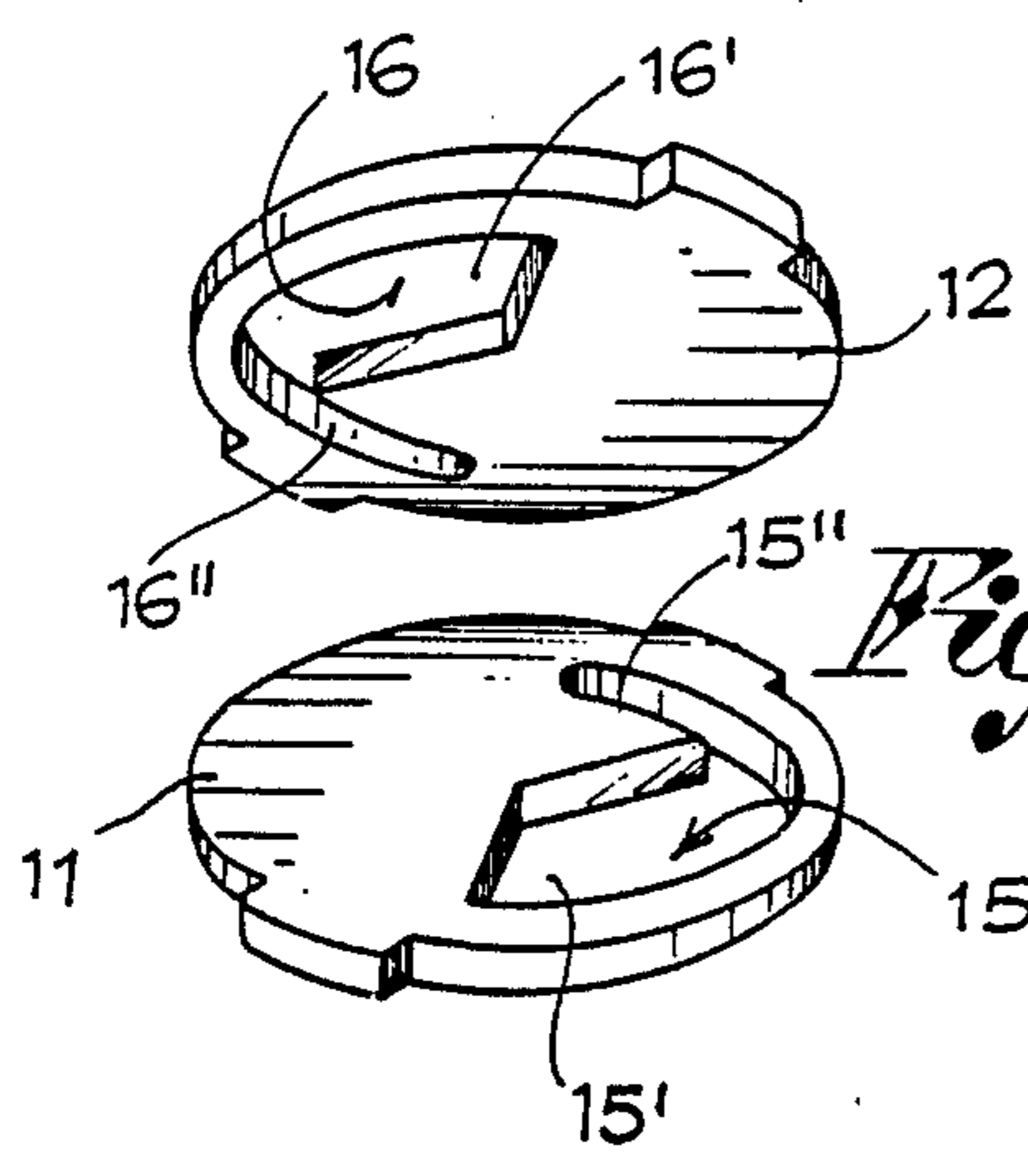


Fig. 3

Fig. 3a

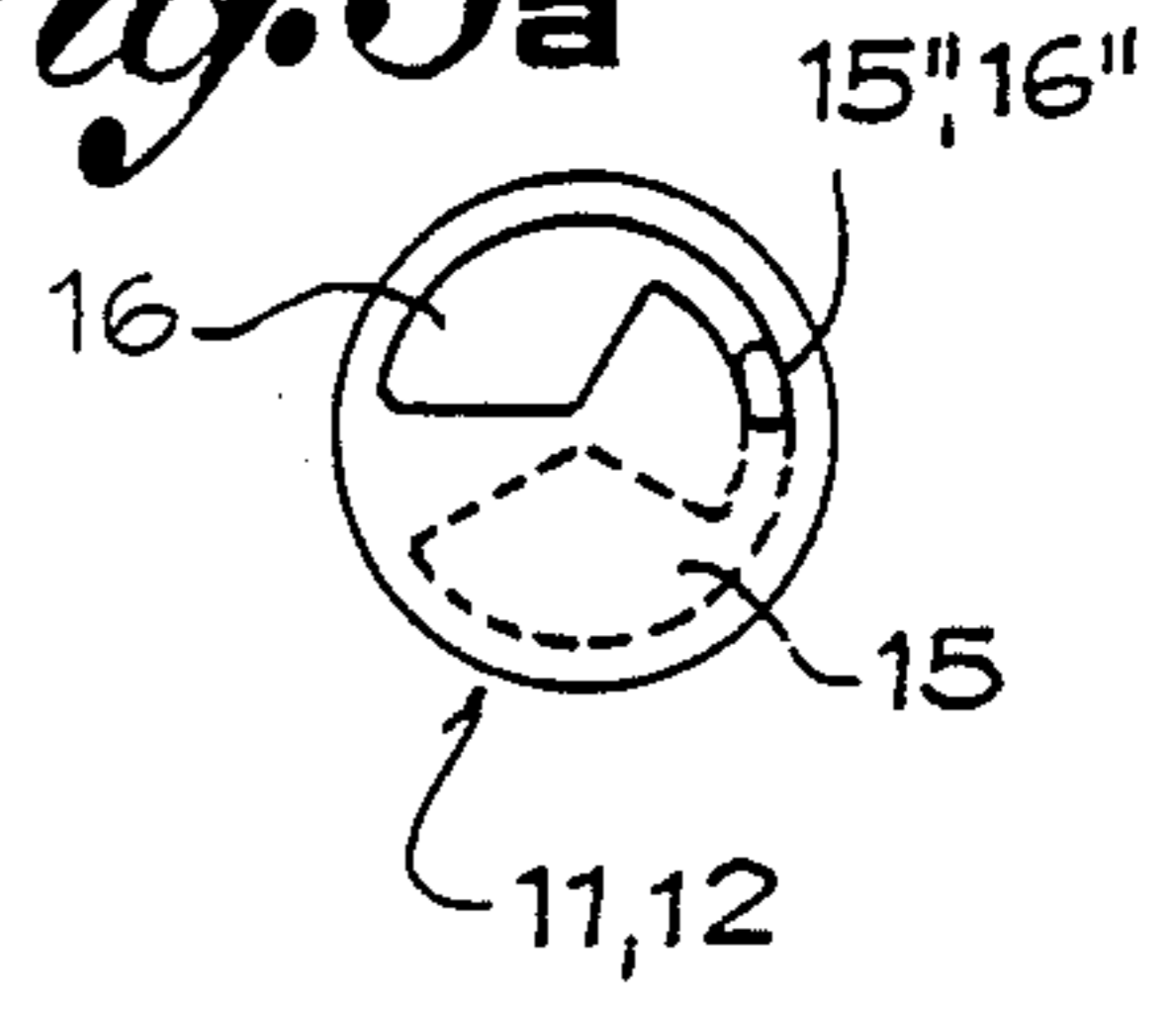
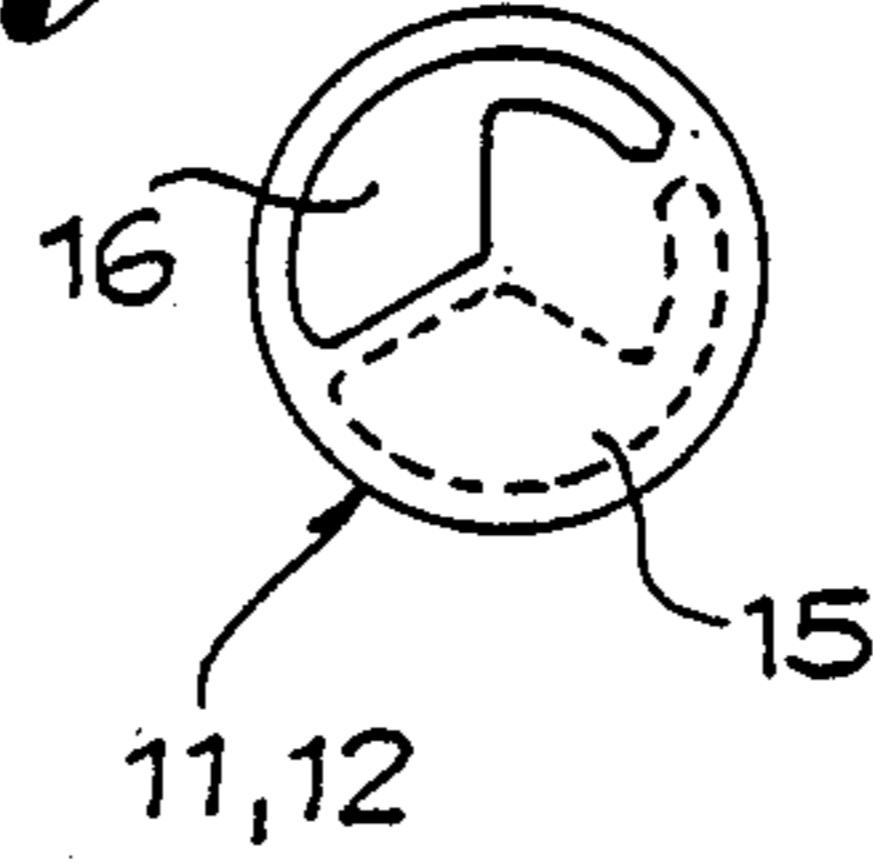


Fig. 1

Fig. 3b

Fig. 3c

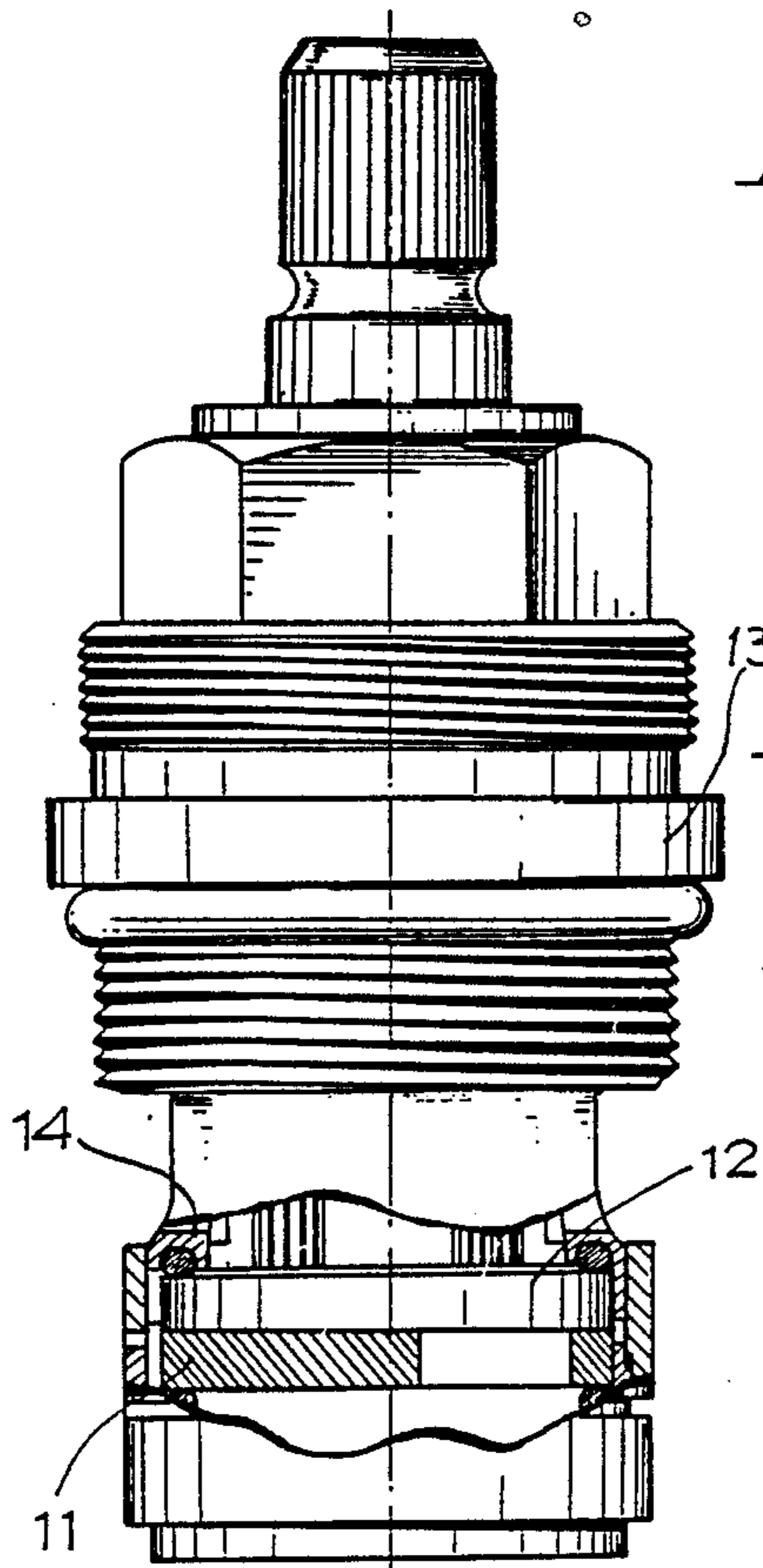
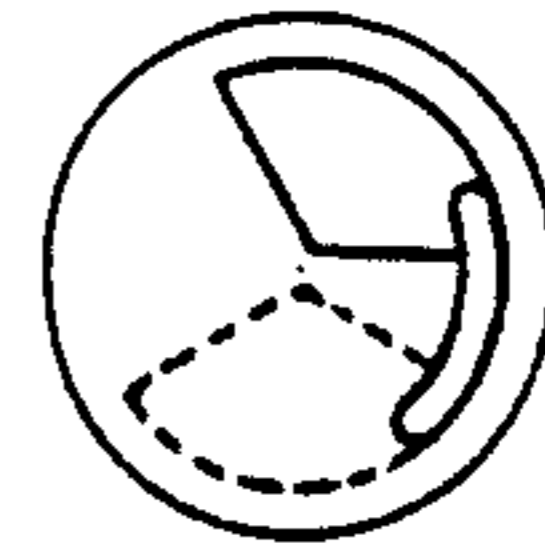
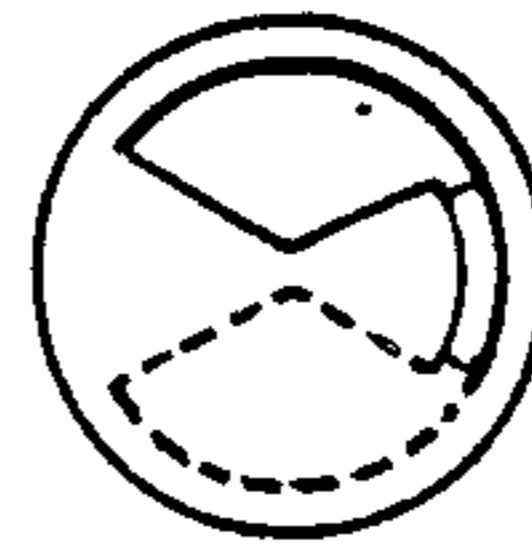


Fig. 3d

Fig. 3e

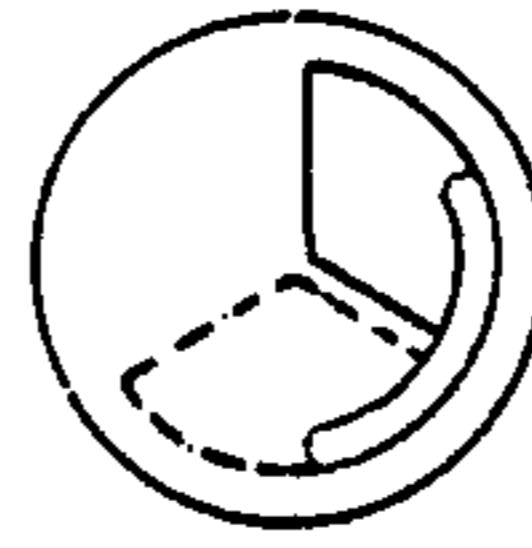


Fig. 3f

Fig. 3g

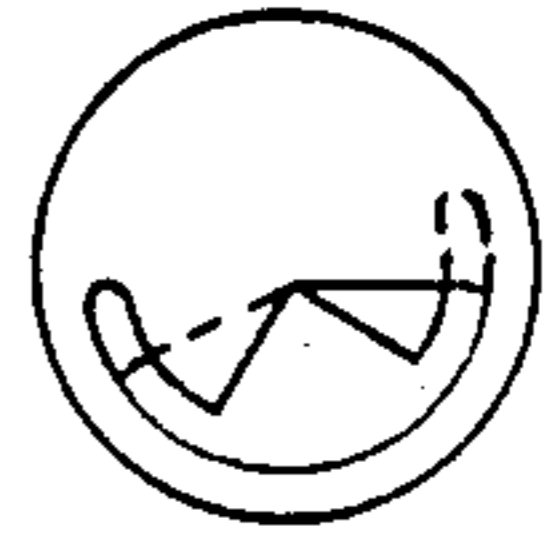
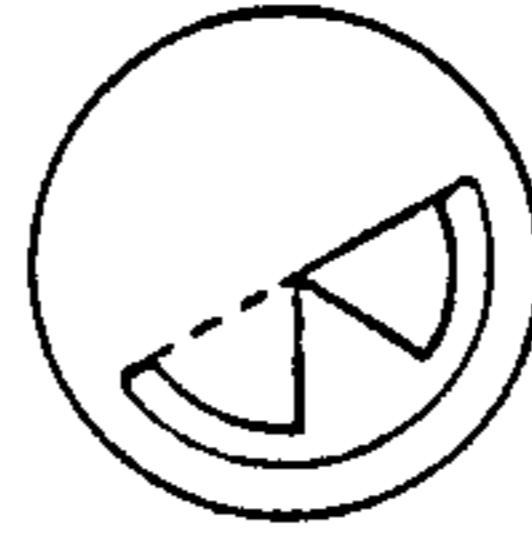


Fig. 3h

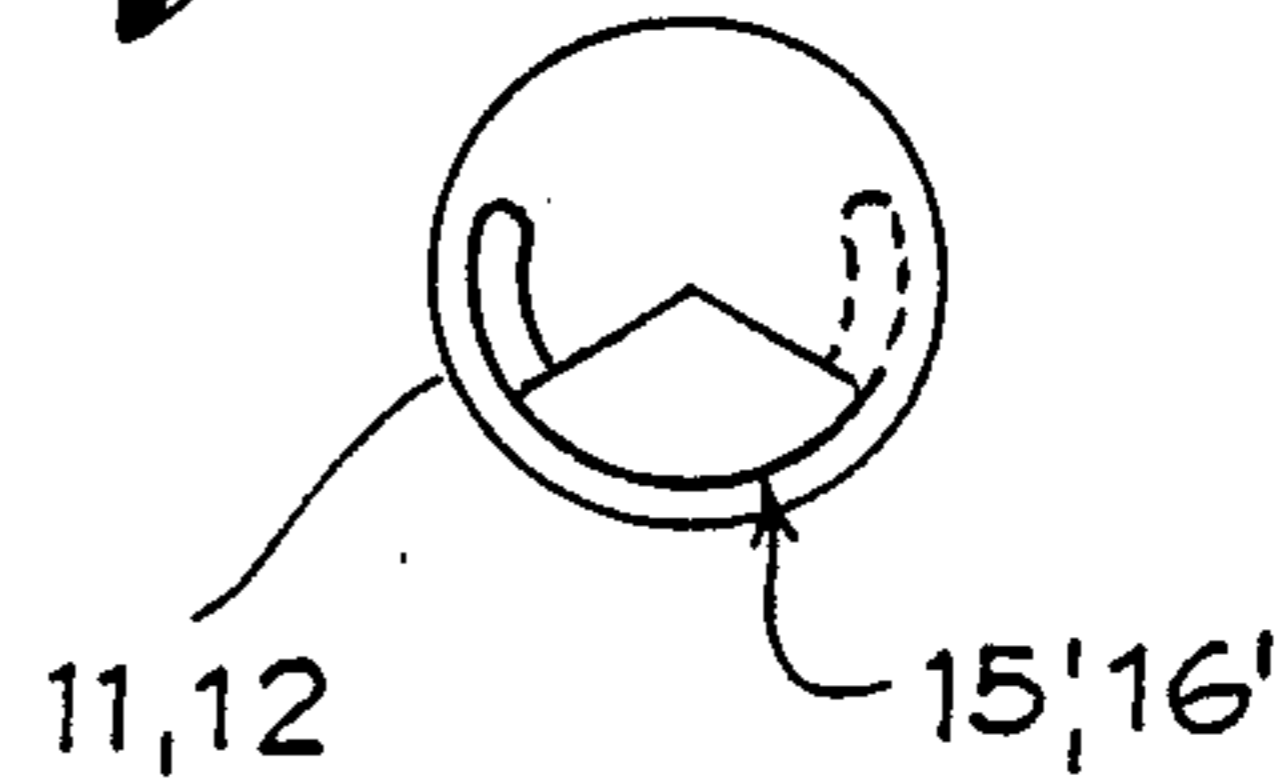


Fig. 2

**PAIR OF COOPERATING DISKS TO CONTROL
THE DELIVERY OF LIQUID IN SO-CALLED
"SCREW" VALVES**

The present design pattern generally concerns seal- 5
ing and delivery control elements in valves and in
particular in the so-called "screw" type valves with
ceramic disks.

In the above quoted screw-valves the use of two 10
superimposed ceramic disks to control its opening and
closing in order to regulate the flow of the delivered
liquid is already known, said disks having some dis-
placeable openings or slots to space or partially super-
pose them. To this purpose, one disk is fixed and station-
ary, while the other one is controlled and displaceable 15
on the fixed one to put its openings or slots either far
from or in partial or total correspondence with those in
the fixed disk.

According to the standard executions each of said 20
slots or openings in each disk occupies a segment of the
surface varying from 90 to 120 degrees, so that a rota-
tion of the same angular amplitude of the movable disk
on the fixed one causes the passage from the closing
position to that of the complete opening of the valve.

In these conditions the opening and closing of the 25
valve is often too abrupt to allow a gradual and progres-
sive variation and control of the flow of the delivered
liquid. In addition, a fast closure of the valve may easily
cause some undesirable phenomena and noises in the
hydraulic installation, like the water hammer which is 30
actually due to abrupt changes in the delivery and
therefore to some sudden changes of pressure.

It is instead the object of the present invention to 35
provide the screw-valves of the above mentioned type
with a pair of ceramic disks, both presenting a slot or
opening with an angular amplitude and having a partic-
ular shape in order to allow:

- a more ample rotation (up to 240°) of the movable 40
disk on the fixed one while passing from the closed
position to that of full opening;
- a progressive and gradual variation of the flow of the
delivered liquid; and in consequence
- the elimination of any kind of water hammer in the
hydraulic installation owing to the absence of 45
abrupt pressure changes.

To this purpose both of the superimposed ceramic 50
disks for the opening and closing of the screw type
valve, one of which is fixed and the other one is mov-
able, are presenting at least one slot or opening com-
posed by a segment like portion and a tapered and
curved portion extending from one end of the segment
portion, the slot or opening in one disk extending in a
direction which is opposite to that of the other disk, so
that during the opening motion the curved and tapered 55
portions of the two disks are the first to superimpose
and thus gradually increase the delivery of the liquid and
are the last ones to be separated during the closing
motion and thus gradually throttle the delivery, the
maximum delivery of the fluid being obtained when the
two larger segment like portions of the two disks are 60
superimposed.

The enclosed drawing shows an embodiment of the
two disks, the details of which will hereinafter be de-
scribed.

In said drawing:

FIG. 1 shows two separated disks;

FIG. 2 shows a partial section of a valve incorporat- 65
ing the two disks; and

FIGS. 3 to 3h show a sequence of the positions of the
slots or openings in the two superimposed disks during
the stages of opening and closing of the valve.

According to the invention the two equal disks 11, 12
are superimposed in opposite positions and mounted in
a known manner in a screw type valve 13 (see FIG. 2)
where the bottom disk 11 is fixed and stationary and the
top disk 12 is controlled by an actuator 14 to rotate on
the fixed disk.

To allow the delivery of the liquid through the valve,
each of the two disks presents an opening or slot 15, 16
which can be reciprocally moved from a spaced posi-
tion to a partial or total correspondence by rotating the
movable disk 11 on the fixed disk 12.

In particular, each slot or opening 15, 16 of each disk 15
11, 12 is composed of a segment like portion 15', 16' and
a narrow and curved portion 15'', 16'' respectively start-
ing from segment 15', 16'.

In the embodiment shown in the drawing the segment 20
15', 16' of each slot occupies a sector of 120° approxi-
mately and the tapered curved section an angle of 60°
approximately, so that the full angular extension of the
slot is 180° approximately.

If each disk had two slots each of them would have
an extension of nearly 90°, still maintaining a ratio of 2:1
between the segment like portion and the tapered
curved portion.

When the two disks 11, 12 are mounted into the valve
and superimposed, the slot 15 in the bottom an fixed
disk 11 is opposite to slot 16 in the top and movable disk 30
16. In particular, the tapered curved portion 15'' of slot
15 in the fixed disk 11 is turned in a direction which is
opposite to the sense of rotation of the movable disk 12
during its opening motion as shown in FIGS. 1 and 3 in
the enclosed drawing, while slot 16 in the top disk 12
has its tapered curved end 16'' turned in the sense of
rotation of the movable disk during the opening motion
of the valve.

When the slots 15 and 16 are distant from each other 40
they do not allow any passage of liquid and thus the
valve is closed. To open the valve it is enough to turn
the movable disk 12 and take its slot 16 towards slot 15
in the fixed disk 11. As shown in the sequence of FIGS.
3a to 3h, the opening takes place gradually, the tapered
and curved portions 15'', 16'' being the first to superim- 45
pose, while during the further rotation also segments
15', 16' are superimposing till they are also in full corre-
spondence.

In consequence, during the opening motion the flow 50
is gradually increased till it reaches its maximum when
the segment portions 15', 16' are coinciding (see FIG.
3h), the opening being complete, in the illustrated em-
bodiments, when the movable disk has been turned by
240° on the fixed disk. When closing the valve the same
stages take place in the opposite sequence, the flow of
the liquid being gradually reduced till it is totally inter-
rupted. The whole construction serving the purpose of
the invention, even if each disk is provided with two
slots of the same shape.

I claim:

1. A pair of superimposed ceramic disks for faucet 65
valves, comprising: a fixed disk having a fixed disk
opening passing through the fixed disk with a first arcu-
ate wall cooperating with a second arcuate wall spaced
a substantially constant distance from said first arcuate
wall to define a slot opening portion having a substan-
tially constant width and cooperating with opposite
walls to define an angular segment opening portion, the

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fixed disk segment opening portion and the fixed disk slot opening portion being contiguous; a movable disk having an opening passing through the movable disk with a first arcuate wall cooperating with a second arcuate wall spaced a substantially constant distance from said movable disk first arcuate wall to define a slot opening portion having a substantially constant width and cooperating with opposite walls to define an angular segment opening portion, the movable disk segment opening portion being contiguous with the movable disk slot opening portion; said movable disk being superimposed on said fixed disk with said movable disk slot opening portion lying adjacent said fixed disk slot opening portion such that rotation of said movable disk results first in superposition of said movable disk slot opening portion and said fixed disk slot opening portion and further movement of said movable disk results in

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superposition of said movable-disk segment opening portion and said fixed disk segment opening thereby first establishing a small amount of flow through said slot opening portions and gradually increasing any flow of delivered liquid as said segment openings are brought into coincidence with the flow of liquid reaching a maximum when the two segment openings are coinciding.

2. A pair of ceramic disks according to claim 1, wherein the ratio between the angular length of each segment opening portion to the angular length to each slot opening portion is 2:1.

3. A pair of ceramic disks according to claim 2 wherein each said arcuate walls extends substantially 180°.

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